

REMARKSStatus of the claims:

With the above amendments, claim 10 has been added and claims 1-9 have been amended. Claims 1-10 are pending and ready for further action on the merits. No new matter has been added by way of the above amendments. The amendments to claims 1 and 2 have support at page 10, line 14 to page 11, line 2. The amendment to claim 3 has support at page 8, line 16 as well as Example 6. Claims 3-9 have been amended to address an objection by the Examiner. Reconsideration in light of the following remarks is respectfully requested.

Drawings

The Examiner has objected to Figure 1 as not having a legend that states that it is prior art. Attached to the end of this amendment, please substitute the enclosed Figure 1 with the legend --Prior Art-- for the present Figure 1. It is believed that this new Figure satisfies the objection. Withdrawal thereof is respectfully requested.

Claim Objections

The Examiner has objected to claims 3-9. Claims 3-9 have been objected to for the phrase "set fourth". Claims 3-9 have been amended to recite "set forth". Claim 4 has been objected

to for reciting that "u" and "v" can be equal to 1. The Examiner asserts that if $u+v+w=1$, then "u" and "v" must both necessarily be less than 1 if the smallest "w" can be is 0.01. Claim 4 has been amended accordingly to recite that " $0 \leq v < 1$ " and " $0 \leq u < 1$ ". It is believed that with these amendments that the objections have been obviated. Withdrawal of the objections is respectfully requested.

Rejections under 35 USC §102

Claims 1-3, 5, 6, 8, and 9 are rejected under 35 §102(e) as being anticipated by Mauk '088 (US Patent No. 5,828,088). The Examiner asserts that Mauk '088 discloses epitaxial lateral overgrowth structures, which employ an ELOG mask for growing III-V device layers over III-V epitaxial layers. The Examiner further asserts that the III-V layers can be gallium nitride or its alloys. The Examiner further asserts that Mauk '088 discloses that the mask may be composed of metals such as tungsten or a metal with a dielectric layer.

This rejection is traversed for the following reasons.

Mauk '088 discloses a liquid phase epitaxy process, which is fundamentally different from the vapor phase epitaxy method disclosed and claimed in instant invention. Moreover, Mauk '088 shows only gallium-arsenide based material, but does not show a concrete example of nitride based materials. Accordingly, Mauk

'088 cannot anticipate the instant invention because it fails to disclose the elements of the instant invention. Withdrawal of the rejection is warranted and respectfully requested.

Rejections under 35 USC §103

Claims 4 and 7 are rejected under 35 §103(a) as being unpatentable over Mauk '088.

Regarding claim 4, the Examiner asserts that it would have been obvious to use aluminum gallium indium nitride in LEDs, as their use was well known in the field at the time of filing the instant application. The Examiner acknowledges that Mauk '088 does not disclose using InGaAlN.

Regarding claim 7, the Examiner asserts that Mauk '088 discloses multi-layer masks but acknowledges that Mauk '088 does not specifically disclose that the dielectric layer for a multilayer mask can be SiO₂. However, the Examiner asserts that a SiO₂ dielectric layer for multilayer masks were well known at the time of filing the application as evidenced by the instant written description.

These rejections are traversed for the following reasons.

Present Invention

The present invention discloses a III-V compound semiconductor having a layer formed from a first III-V compound

semiconductor expressed by the general formula $\text{In}_u\text{Ga}_v\text{Al}_w\text{N}$ where $0 \leq u \leq 1$, $0 \leq v \leq 1$, $0 \leq w \leq 1$, and $u+v+w=1$, a pattern formed on said layer from a material different not only from said first III-V compound semiconductor but also from a second III-V compound semiconductor. The present invention further discloses a layer formed on the first III-V compound semiconductor. The pattern from the second III-V compound semiconductor is expressed by the general formula $\text{In}_x\text{Ga}_y\text{Al}_z\text{N}$ where $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$, and $x+y+z=1$. The full width at half maximum of the (0004) reflection X-ray rocking curve of the second III-V compound semiconductor is 700 seconds or less regardless of the direction of X-ray incidence. Finally the compound semiconductor of the instant invention is formed by a vapor phase epitaxy method.

Disclosure of Mauk '088

Mauk '088 discloses a device structure and crystal growth process for making the same. The single-crystal semiconductor layers are formed over metal or composite layers. The metal layers function as buried reflectors to enhance the performance of LEDs, solar cells, and photodiodes. The structures are made by a modification of a well-established metallic solution growth process. The lateral overgrowth process can be enhanced by imposing an electric current at the growth interface (termed liquid-phase electro-epitaxy). However, the use of an electric

current is not crucial. The epitaxial lateral overgrowth technique was also applied to silicon growth on metal-masked silicon substrates.

Removal of Mauk '088

As discussed above, Mauk '088 discloses a liquid phase epitaxy process, which is fundamentally different from the vapor phase epitaxy method disclosed and claimed in the instant invention. Accordingly, Mauk '088 cannot render obvious the instant invention because Mauk '088 fails to disclose or suggest the elements of the instant invention. Withdrawal of the rejection is warranted and respectfully requested.

Double Patenting

Claims 1-9 have been rejected under 35 USC §101 as being the same as claims 1-9 in Application No. 09/396,942. It is believed that Application No. 09/396,942 is no longer pending. Accordingly, this rejection is now moot. Withdrawal of the rejection is respectfully requested.

With the above remarks and amendments, it is believed that the claims, as they now stand, define patentable subject matter such that a passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a three (3) month extension of time for filing a reply in connection with the present application, and the required fee of \$920.00 is attached hereto.

If any questions remain regarding the above matters, please contact Applicant's representative, Andrew D. Meikle, in the Washington metropolitan area at the phone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By  _____

Andrew D. Meikle, #32,868

ADM/TBS/crt

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

ATTACHMENTS: VERSION WITH MARKINGS TO SHOW CHANGES MADE
Figure 1

VERSION WITH MARKINGS TO SHOW CHANGES MADEIN THE CLAIMS:

The claims have been amended as follows:

1. (Amended) A III-V compound semiconductor having a layer formed from a first III-V compound semiconductor expressed by the general formula $\text{In}_u\text{Ga}_v\text{Al}_w\text{N}$ [(]where $0 \leq u \leq 1$, $0 \leq v \leq 1$, $0 \leq w \leq 1$, and $u+v+w=1[)]$, a pattern formed on said layer from a material different not only from said first III-V compound semiconductor but also from a second III-V compound semiconductor hereinafter described, and a layer formed on said first III-V compound semiconductor and said pattern from said second III-V compound semiconductor expressed by the general formula $\text{In}_x\text{Ga}_y\text{Al}_z\text{N}$ [(]where $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$, and $x+y+z=1[)]$, wherein the full width at half maximum of the (0004) reflection X-ray rocking curve of said second III-V compound semiconductor is 700 seconds or less regardless of the direction of X-ray incidence, and the compound semiconductor is formed by a vapor phase epitaxy method.

2. (Amended) A III-V compound semiconductor having a layer formed from a first III-V compound semiconductor expressed by the general formula $\text{In}_u\text{Ga}_v\text{Al}_w\text{N}$ [(]where $0 \leq u \leq 1$, $0 \leq v \leq 1$, $0 \leq w \leq 1$, and $u + v + w = 1[)]$, a pattern formed on said layer from a material

different not only from said first III-V compound semiconductor but also from a second III-V compound semiconductor hereinafter described, and a layer formed on said first III-V compound semiconductor and said pattern from said second III-V compound semiconductor expressed by the general formula $\text{In}_x\text{Ga}_y\text{Al}_z\text{N}$ [(]where $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$, and $x + y + z = 1$ [])], wherein an upper surface of said pattern is not in contact with said second III-V compound semiconductor, and the compound semiconductor is formed by a vapor phase epitaxy method.

3. (Amended) A III-V compound semiconductor as set [fourth] forth in claim 1 or 2, wherein said pattern is formed from W or tungsten nitride.

4. (Amended) A III-V compound semiconductor as set [fourth] forth in claim 1 or 2, wherein the first III-V compound semiconductor is expressed by the general formula $\text{In}_u\text{Ga}_v\text{Al}_w\text{N}$ [(]where [$0 \leq u \leq 1$] $0 \leq u < 1$, [$0 \leq v \leq 1$] $0 \leq v < 1$, $0.01 \leq w \leq 1$, and $u + v + w = 1$ [])].

5. (Amended) A III-V compound semiconductor as set [fourth] forth in claim 1 or 2, wherein said pattern is a lamination comprising at least two layers which are contacting each other and made of different materials.

6. (Amended) A III-V compound semiconductor as set [fourth] forth in claim 1 or 2, wherein said pattern is a lamination comprising at least a layer made of W and a layer made of a material other than W.

7. (Amended) A III-V compound semiconductor as set [fourth] forth in claim 5, wherein said pattern is a lamination comprising at least a layer made of W and a layer made of SiO₂.

8. (Amended) An electronic device comprising the III-V compound semiconductor as set [fourth] forth in claim 1 or 2.

9. (Amended) A light emitting device comprising the III-V compound semiconductor as set [fourth] forth in claim 1 or 2.

Claim 10 has been added.